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| EXAMINER | |
|---|---|
| HORNING, JOEL G | |
| ART UNIT | PAPER NUMBER |
| 1792 | |

| NOTIFICATION DATE | DELIVERY MODE |
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| 09/18/2009 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/560,173 | OCHIAI ET AL. | |
| | Examiner | Art Unit | |
| | JOEL G. HORNING | 1792 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *13 July 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *52-76* is/are pending in the application.

4a) Of the above claim(s) *52-55,59-71 and 74-76* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *56-58,72 and 73* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03-08-2006;01-24-2007;08-28-2008;05-01-2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

1. **Claims 52-55, 59-71 and 74-76** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions/species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 07-13-2009.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 72-73** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 72 recites the limitation "forming a protective coating coated on the base coating and ***the intermediate substance***" in line 6 of the claim. There is insufficient antecedent basis for this limitation in the claim because an “intermediate substance” is not previously described, so it is unclear how to put a protective coating on it. For the purpose of examination, the intermediate substance is whatever material is intermediate between the electrode and the base layer of the work-piece is this intermediate material.

**Claim 73** is rejected for depending upon claim 72.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 56-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schell et al (US 5952110) in view of Koizumi et al (EP1035231, as supplied by applicant).

The instant **claim 56** is directed towards a method for producing a surface treated component of a turbine engine, comprising:

a. Applying a compressed powder of a mixture including one or more oxidation-resistant metals and one or more ceramic materials as a tool electrode, and
b. Forming a protective coating on a portion of an untreated component by processing the portion as a workpiece of an electric spark machine with the tool electrode

Schell et al is directed towards a method for forming a protective (and abrasive/wear resistant) coating on a gas turbine engine component (abstract). The method comprises depositing a layer of an oxidation resistant metal alloy, then depositing a composite layer of (1) an oxidation resistant metal, such as a NiCr (e.g. NiCrCoAl) alloy **12** and (2) abrasive particles (col 5, line 34-46). The abrasive particles **16** in the composite layer can be ceramics, such as alumina (col 5, lines 25-34) and Schell et al teaches the use of other abrasives material, such as cubic boron nitride, as common, with materials that last through the green run of the

engine as preferred (col 1, line 61 through col 2, line 4). Schell et al does not teach depositing this composite layer by an electric spark machine process.

However, Koizumi et al is also directed towards a process for depositing wear resistant coatings. It teaches that electrospark alloying (ESA) methods are known to be suitable for the deposition of such coatings. This method works by creating a spark between the substrate and a tool electrode formed of the material to be deposited, so that material from the electrode transfers to the substrate and forms a coating [0002].

Koizumi et al further teaches forming an electrode by mixing powders of the materials to be deposited. This should include at least one metal from a list which includes: Ni, Co, Cr and Al. The powder mixture is compressed and treated in order to form an axial body, which is the tool electrode [0010]. In addition to the metal powder, abrasive powders, such as cubic BN, is added to the powder mixture in order to increase its wear resistance [0023].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to deposit the NiCr alloy/Alumina composite coating of Schell et al by an ESA process as taught by Koizumi et al by: mixing NiCr Alloy powder with alumina powder and forming it into a tool electrode, and generating a spark between the electrode and the substrate so that the substrate is coated. Such a person would have been motivated to do so, since it was a known deposition method to be suitable for the formation of such protective coatings and would produce predictable results **(claims 56 and 57)**

Regarding **claim 58**, Schell et al further teaches depositing an additional ceramic layer **14** over the composite metal/ceramic layer (which can be considered to comprise a protective metal coating portion **12** and a second $ZrO_2$-Y portion **16**, see figure 1) by a PVD process (col 5, lines 37-48), which further protects the substrate.

4. **Claims 72-73** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schell et al (US 5952110) in view of Koizumi et al (EP 1035231) in view of Kamo et al (US 4738227) in view of Church et al (US 3956531) .

These claims are directed towards a process for producing a surface treated portion of a turbine engine, comprising:

a. Forming a base coating on a portion of an untreated component by processing the portion as a workpiece of an electric spark machine with a tool electrode of an oxidation resistant metal;
b. Forming a protective coating coated on the base coating and the intermediate substance by processing the base coating and the intermediate substance as a workpiece of an electric spark machine with a tool electrode of one or more protective materials selected from the group consisting of oxide ceramics, scubic BN and oxidation-resistant metals; and
c. Closing pores of the protective coating by filling a powder of $SiO_o$ or $MoSi_2$ into the pores and heating the portions enough to change the powder into amorphous $SiO_2$.

5. Schell et al is directed towards a method for forming a protective (and abrasive/wear resistant) coating on a gas turbine engine component (abstract). The process forms the structure shown in figure 1, and comprises:

    a. depositing a first layer of an oxidation-resistant NiCr metal alloy (e.g. NiCrCoAl) alloy (**claim 73**, col 5, lines 34-37), then

    b. depositing a second protective layer comprising a NiCr alloy and an intermediate (abrasive) particle substance **16**, which has 40-70% of the particles size extending out of the NiCr alloy material (col 5, lines 36-41). Schell et al teaches a variety of abrasives as known to the art, like cubic boron nitride and alumina (col 1, lines 58-63). A ceramic material **14** is then deposited between the abrasive particles as part of this protective layer by plasma spraying (col 5, line 34-46). The ceramic is preferably made of a zirconia (col 4, lines 66-67) and it improves the durability and thermal stability of the underlying engine component (col 5, lines 6-12).

Schell et al does not teach depositing this first or second composite layer by an electric spark machine process. It also does not teach filling the pores in the zirconia coating with a $SiO_2$ powder and heating it to form amorphous $SiO_2$.

However, Koizumi et al is also directed towards a process for depositing wear resistant coatings. It teaches that electrospark alloying (ESA) methods are known to be suitable for the deposition of such coatings. This method works by creating a spark between the substrate and a tool electrode formed of the material to be deposited, so that material from the electrode transfers to the substrate and forms a

coating [0002]. This is done with a gas between to the substrate and the electrode (intermediate material) [0025].

Koizumi et al further teaches forming an electrode by mixing powders of the materials to be deposited. This should include at least one metal from a list which includes: Ni, Co, Cr and Al. The powder mixture is compressed and treated in order to form an axial body, which is the tool electrode [0010]. In addition to the metal powder, abrasive powders, such as cubic BN, is added to the powder mixture in order to increase its wear resistance [0023].

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to deposit the first NiCr alloy coating of Schell et al by an ESA process as taught by Koizumi et al and then to deposit the first part of the second protective layer by mixing NiCr Alloy powder with alumina (metal oxide) or cubic BN powder and forming it into a tool electrode, and generating a spark between the electrode and the substrate so that the substrate is coated. The zirconia of the second protective layer could then be deposited by plasma spray. Such a person would have been motivated to deposit these metal containing layers by the ESA process since it was a deposition method known to be suitable for the formation of such protective and abrasive coatings which would produce predictable results.

Kamo et al is directed towards combustion engines (abstract) and contains teaching highly relevant to the insulating zirconia coatings on such components. Like Schell et al it teaches plasma spraying zirconia coatings on its engine components as a thermal barrier (col 5, lines 40-45). Kamo et al additionally

teaches that, in order to further increase the durability of the zirconia, coating the zirconia layer with a ceramic coating material comprising silica which is impregnated into the pores of the plasma sprayed zirconia with a liquid chromium precursor and then thermally treated to 1000°F so that it closes the pores in the zirconia (col 5, lines 45-63). Since it does not say that the resulting silica is crystalline, so a person of ordinary skill in the art would expect that amorphous silica (glass) would be used. Furthermore after the heat treatment the resulting silica would be glassy (amorphous). Kamo et al incorporates the Church et al reference (US 3956531) in order to teach how the silica containing coating is used (col 5, lines 64-66), but Kamo et al itself does not specifically state that the silica is in the form of a powder.

The Church et al reference teaches that when the liquid chromium composition contains additional oxides, they are in the form of particulate powders which are mixed into a slurry which is then applied to the substrate surface (col 29, line 67 through col 30, line 61).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to apply such a silica powder containing coating to the plasma sprayed coating of Schell et al in order to increase the durability of the zirconia layer, which, as shown above, Schell teaches is important to the zirconia layer.

When a reference discloses the limitations of a claim except for a property, and the Examiner cannot determine if the reference inherently possesses that property (in this case, that the heat treated silica would be amorphous), the burden is shifted to Applicant(s). In re Fitzgerald, USPQ 594 and MPEP §2112 **(claim 72)**.

## *Conclusion*

6. No current claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792